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Distributional Updates and Conservation Status of Bats from Louisiana

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Abstract

We report results of a statewide survey for bats primarily based on culvert searches and supplemented with records from mist netting and the Louisiana Natural Heritage Program operated by Louisiana Department of Wildlife and Fisheries. In total we describe 59 parish distributional records as well as provide information on conservation status for six species.

Key words: *Corynorhinus rafinesquii*, *Eptesicus fuscus*, *Lasiurus seminolus*, Louisiana, *Myotis austroriparius*, *Myotis septentrionalis*, *Perimyotis subflavus*

Introduction

Since the publication of *The Mammals of Louisiana and Its Adjacent Waters* (Lowery 1974), relatively few researchers have published information on distribution of mammals in the state (Choate et al. 1994). This is despite the fact that new species continue to be added to the faunal list of Louisiana (Crnkovic 2003; Stevens 2015). Bats represent an important component of the fauna of Louisiana and surveys of distribution and abundance are necessary to improve understanding of their ecology in the state. Highway culverts form important roost sites for many species of bats (Mirowsky et al. 2004; Martin et al. 2005; Boonman 2011) and offer an ideal approach to document distribution of species for a number of reasons. First, culverts are common constituents of many road systems, especially large volume roads such as interstates and US Highways. Second, when in place, culverts tend to be numerous across long stretches of highway and often are fairly uniformly distributed. Such spatial characteristics mean that culverts may be available across a number of different habitats spanned by a typical highway. These circumstances facilitate effective and extensive surveys of culvert roosting bats. Accordingly, in 2013, we initiated a statewide culvert survey for bats to improve information regarding chiropteran distribution in Louisiana.

Materials and Methods

Between June 2013 and January 2016, we examined 1,821 highway culverts in 40 different parishes distributed throughout Louisiana: Acadia, Allen, Ascension, Avoyelles, Beauregard, Bienville, Caddo, Calcasieu, Caldwell, Catahoula, DeSoto, East Feliciana, Evangeline, Franklin, Grant, Jackson, Jefferson Davis, La Salle, Lafayette, Lincoln, Livingston, Madison, Morehouse, Natchitoches, Ouachita, Pointe Coupee, Rapides, Red River, Richland, Sabine, St. Landry, St. Tammany, Tangipahoa, Tensas, Union, Vernon,

Webster, West Baton Rouge, West Feliciana, and Winn (Fig. 1). Summer sampling was conducted between the months of May and August and winter sampling was conducted between November and February.

We restricted sampling to the US-Interstate (I-10, I-12, I-20, I-49, I-55) and US-Highway (US-51, US-61, US-65, US-71, US-84, US-165, US-167, US-171, US-190, US-371, US-425) systems (Fig. 1). Culverts were located visually by driving roadways. Once detected, culverts were systematically examined using a headlamp, flashlight, or spotlight. All cracks, grooves, and weep holes (drains in the top of the culvert) were examined for bats. Bats in crevices were extracted with large forceps whereas others, in particular those roosting in the open, hanging from ceilings, or roosting on walls, were captured with a butterfly net. Captured individuals were identified to species primarily based on Lowery (1974) and either released or collected and prepared as voucher specimens. Handling of bats was according to TTU-IACUC protocol #14032-04 and methods approved by the American Society of Mammalogists (Sikes 2016).

Additional vouchered records were obtained by mist netting over water at Tunica Hills Wildlife Management Area (WMA), which is located in West Feliciana Parish, and the Winn and Catahoula districts of the Kisatchie National Forest. Typically three to five 12-meter mist nets (Avinet TB-12) were deployed over ponds or streams. On most nights, nets were monitored from just before sundown to 12 a.m. Nets were placed in order to directly bisect the middle of ponds or arranged in a zigzag pattern along streams.

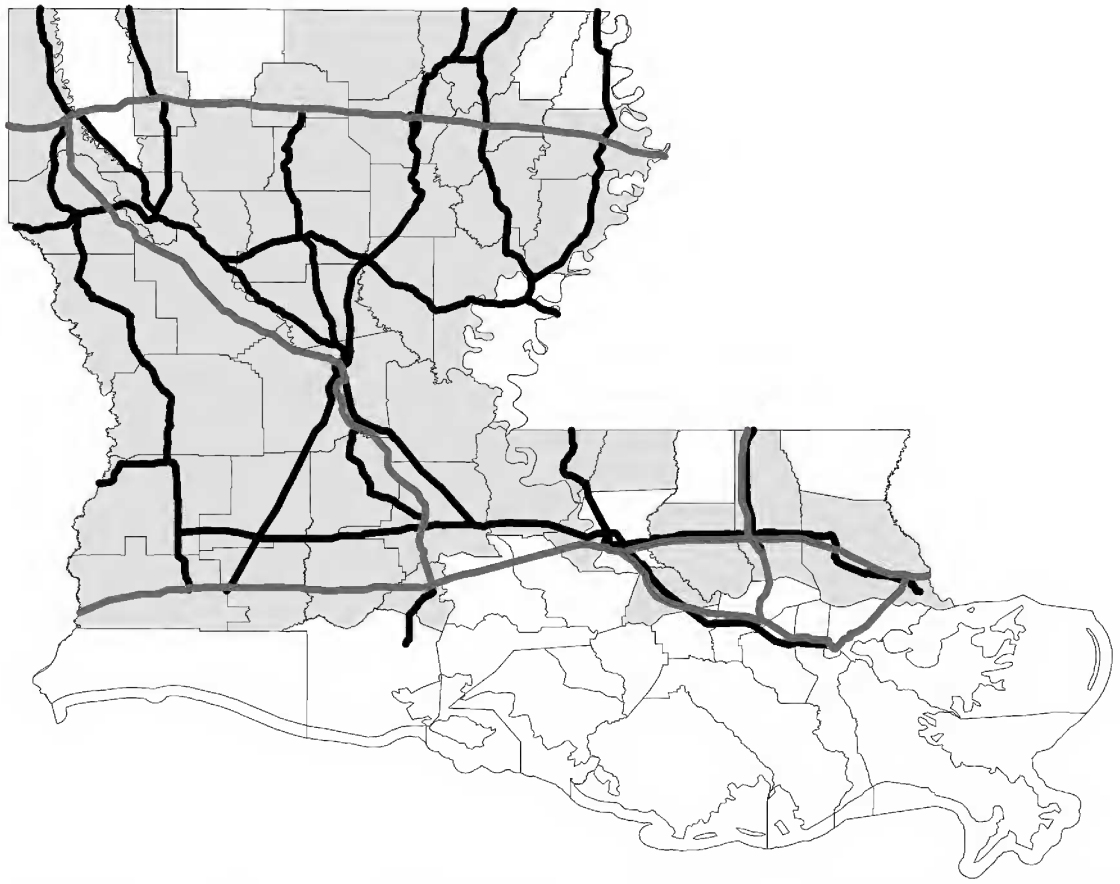

Figure 1. Map of Louisiana with shaded areas showing parishes where culvert surveys were conducted. Black lines refer to US-Highways and gray lines refer to US-Interstate highways that were sampled.

Additional records also came from the Louisiana Natural Heritage Program. This program maintains a database of statewide wildlife distributional records. Although no voucher specimens are available for these records, they are vetted for accuracy before acceptance by an appropriate LDWF specialist and often have associated photos to validate identification.

All voucher specimens were deposited into the mammal collection of the Natural Science Research Laboratory of the Museum, Texas Tech University (TTU catalogue number). Voucher specimen localities were obtained by the authors using a hand-held GPS unit, and are reported in Lat/Long coordinates. Species accounts include specimens obtained, prepared, and retained as museum specimens (Specimens Examined).

RESULTS

Based on the culvert survey, we obtained distributional records from five different bat species (*Myotis austroriparius*, *Myotis septentrionalis*, *Perimyotis subflavus*, *Eptesicus fuscus*, and *Corynorhinus rafinesquii*), representing 43 parish records. We also report an additional three parish records, including one for *Lasiurus seminolus*, based on mist netting at Tunica Hills WMA and the Kisatchie National Forest and 13 records from the Louisiana Natural Heritage Program. The six species representing new parish distributional records are reported upon in detail within the following species accounts.

ORDER CHIROPTERA
Family Vespertilionidae
***Myotis austroriparius* (Rhoads, 1897)**
Southeastern Myotis

As their common name implies, this species is distributed throughout the southeastern United States including Alabama, Arkansas, Florida, Georgia, Illinois, Indiana, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Texas. In Louisiana, *M. austroriparius* is distributed statewide except for the extreme southwest and southeast portions of the state (Choate et al. 1994; Wilson and Ruff 1999). New records were obtained for Beauregard, Caldwell, Catahoula, DeSoto, East Feliciana, Evangeline, Grant, Jackson, LaSalle, Lincoln, Richland, Sabine, St. Landry, Tangipahoa, Union, and Vernon parishes (Fig. 2). Southeastern Myotis used culverts during both summer and winter and in the highest frequency (7.5 percent of all culverts) of all of the chiropteran species sampled during the study (*M. septentrionalis*—<0.5%; *P. subflavus*—3.7%; *E. fuscus*—2.2%; *L. intermedius*—<0.1%; *C. rafinesquii*—2.5%; and *Tadarida brasiliensis*—0.2%).

Conservation status.—The Southeastern Myotis is a species of least concern based on the IUCN Red List and is listed as S4 [apparently secure in Louisiana with many occurrences (100 to 1,000 known extant populations)] by Louisiana Department of Wildlife and Fisheries (Holcomb et al. 2015). Because it is a species of common occurrence and apparently has stable populations, heightened conservation consideration is not warranted at this time.

Specimens examined (14).—Beauregard Parish, US-171, 30°43.647'N 93°14.276'W, TTU-130135; Caldwell Parish, US-165, 31°57.814'N 92°10.312'W, TTU-130136; DeSoto Parish, I-49, 31°59.699′N 93°31.038′W, TTU-130137; East Feliciana Parish, 8.4 km NNE Clinton, 30°56.331′N 91°02.266′W, TTU-130138; Evangeline Parish, I-49, 30°49.454′N 92°13.440′W, TTU-130139; Grant Parish, US-165, 31°46.479'N 92°22.581'W, TTU-130140; Jackson Parish, US-167, 32°20.398'N 92°42.687'W, TTU-130141; LaSalle Parish, US-165, 31°52.452'N 92°15.472'W, TTU-130142; Lincoln Parish, US-167, 32°43.443'N 92°39.373'W, TTU-130143; Richland Parish I-20, 32°26.684'N 91°30.865'W, TTU-130144; Sabine Parish, US-171, 31°21.192'N 93°25.005'W, TTU-130145; St. Landry Parish, I-49, 30°39.624′N 92°03.962′W, TTU-130146; Tangipahoa Parish, US I-55, 30°45.100′N 90°31.992'W, TTU-130147.

Additional records, Louisiana Natural Heritage Program (3).—Catahoula Parish, Sicily Island WMA; Union Parish, Upper Ouchita NWR; and Vernon Parish, Fort Polk, 31°07.153'N 93°06.315'W.

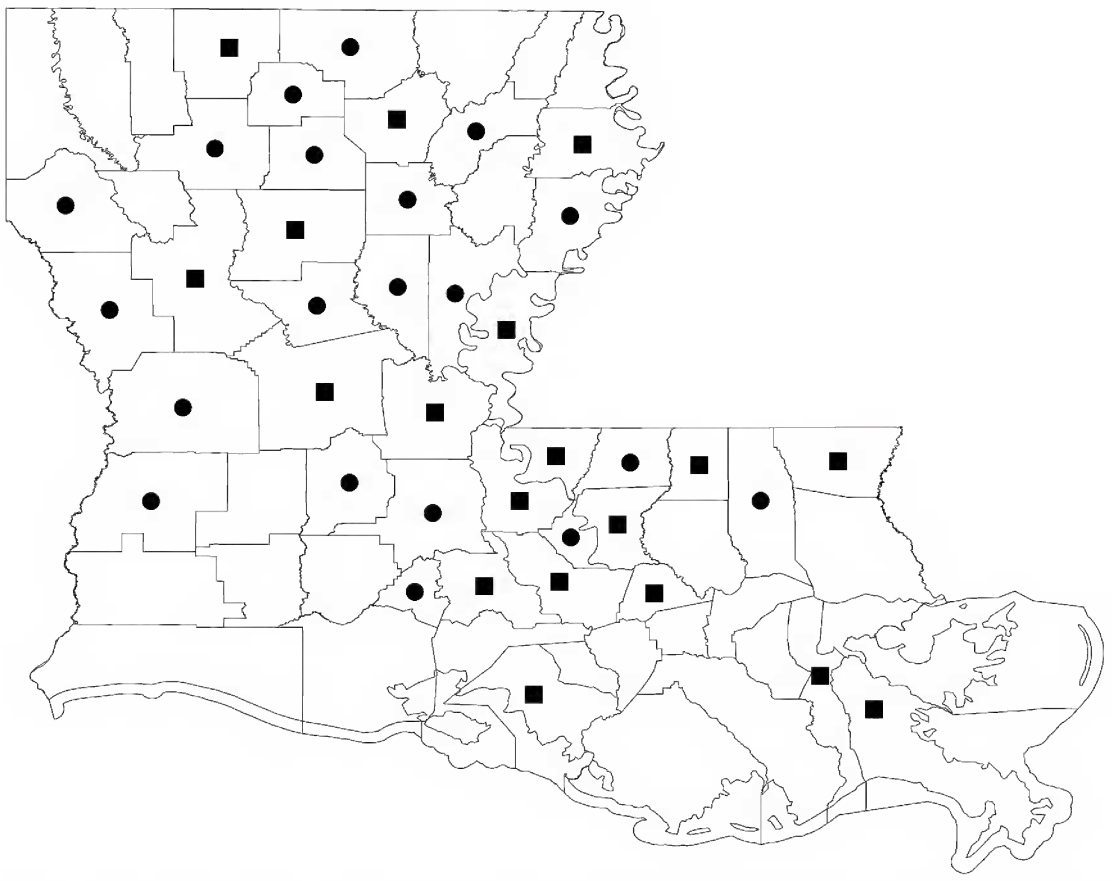

Figure 2. Map of recorded distribution, by parish, of the Southeastern Myotis (*Myotis austroriparius*) in Louisiana. Circles represent new records discovered by our survey whereas squares represent records described by Lowery (1974).

***Myotis septentrionalis* (Trouessart, 1897)**
Northern Long-Eared Bat

Northern Long-Eared Bats are distributed throughout much of Canada and the northeastern portion of the United States (Wilson and Ruff 1999). Recently, *M. septentrionalis* has exhibited drastic population declines across much of its distribution (Frick et al. 2010; Langwig et al. 2012) because of *Pseudogymnoascus destructans*, a fungus that causes White Nose Syndrome (WNS).

Myotis septentrionalis was described only recently as a resident of Louisiana by Crnkovic (2003) in the Kisatchie National Forest, Winn District, Winn Parish. Herein we expand the known distribution of this species to include West Feliciana, Grant, and Jackson Parishes (Fig. 3). Based on these new records, *M. septentrionalis*, although rare, is distributed fairly widely throughout the state. Most of these new records are from localities that we have mist-netted fairly extensively (more than 10 nights). Moreover, at two of these new localities, the Northern Long-eared Bat was surprisingly abundant (Tunica Hills WMA, 4 individuals; Catahoula and Winn Districts of Kisatchie National Forest, 7 individuals).

It is difficult to distinguish *M. septentrionalis* from *M. austroriparius*, primarily because morphological variation found within *M. austroriparius* fully overlaps that of *M. septentrionalis* where these two species occur in sympatry in Louisiana. A distinguishing characteristic diagnosed by Dr. Roger Perry (pers. comm.) has proven to be effective for discriminating

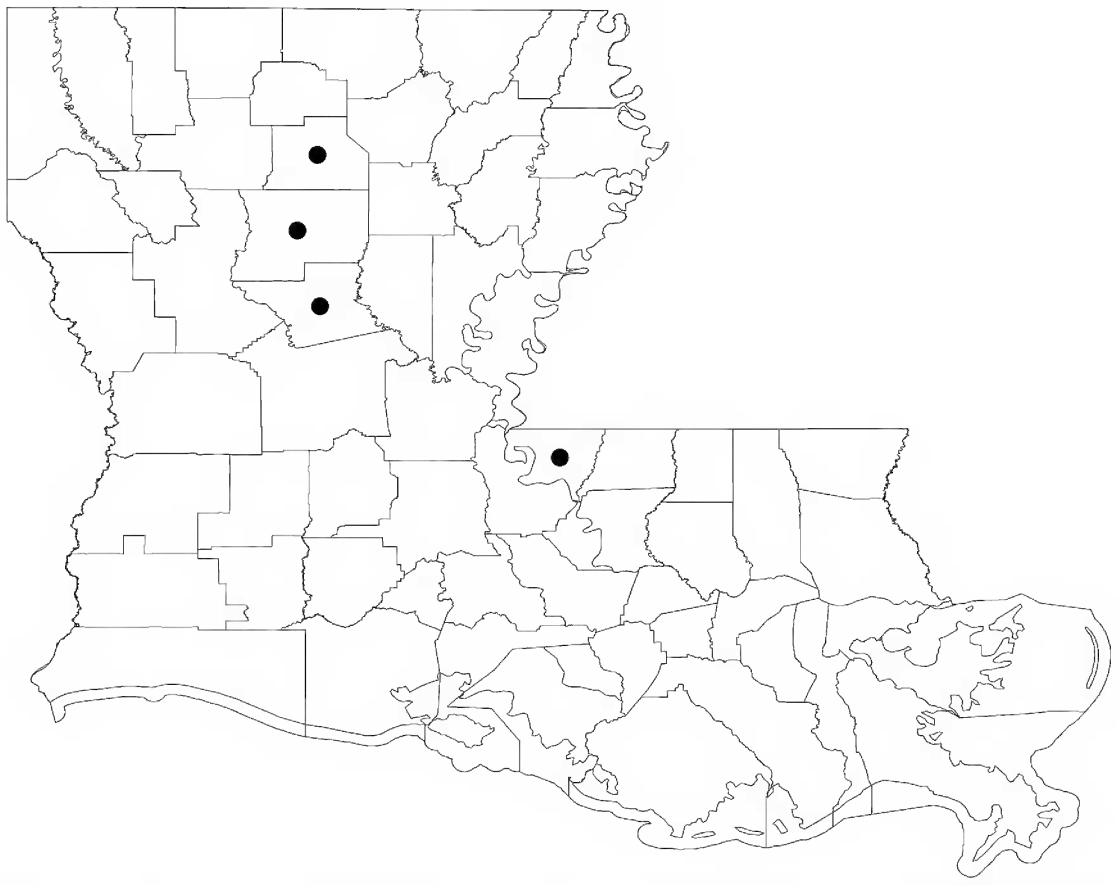

Figure 3. Map of recorded distribution, by parish, of the Northern Long-eared Myotis (*Myotis septentrionalis*) in Louisiana. Circles represent records discovered by our survey.

between the two species in the state without examination of the skull. The plagiopatagium connects at the toe of *M. septentrionalis*, whereas, in *M. austroriparius*, the plagiopatagium connects at the ankle (Fig. 4). Much morphological variation exists within *M. austroriparius* in Louisiana, to the extent that two subspecies were described (but these have now been synonomized; see Lowery 1943 and LaVal 1970). It is possible that *M. septentrionalis* has always been a resident of Louisiana, but was not previously distinguished from *M. austroriparius*.

Conservation status.—Northern Long-Eared Bats currently are listed as threatened under the US Endangered Species Act and are listed as S1 [critically imperiled in Louisiana because of extreme rarity (five or fewer known extant populations) or because of some factor(s) making it especially vulnerable to extirpation] by Louisiana Department of Wildlife and Fisheries (Holcomb et al. 2015). Listing primarily is due to the drastic reductions in abundance across most of its geographic range (Powers et al. 2015). To date, no WNS has been detected in Louisiana (Stevens, Barnes, Garcia, and Gregory, pers. obs.) for any species of bat. Moreover, increases in documented distribution of the Northern Long-Eared Bat are encouraging. Future research on distribution, population trends, and roosting ecology of *M. septentrionalis* in Louisiana are warranted. Perhaps more importantly, and assuming that populations are stable in Louisiana, is the possibility that this species may not succumb to WNS in the state. If so, Louisiana may be an important source area for recolonization of *M. septentrionalis* into other portions of its former geographic range. Therefore, heightened conservation status is warranted.

Figure 4. Diagnostic feature distinguishing *Myotis austroriparius* (left) from *M. septentrionalis* (right). Note that the plagiopatagium of *M. septentrionalis* connects at the toe whereas for *M. austroriparius* it connects at the ankle.

Specimens examined (2).—Jackson Parish, US-167, 32°22.679'N 92°42.061'W, TTU-131156; West Feliciana Parish, US-61, 30°59.859'N 91°20.854'W, TTU-130149.

Additional records (1).—Grant Parish, USFS Road 556, 31°45.416'N 92°36.743'W (unvouchered skin punch, TK-198257).

***Corynorhinus rafinesquii* (Lesson 1827)**
Rafinesque's Big-Eared Bat

Corynorhinus rafinesquii has a geographic distribution similar to the Southeastern Myotis. It is distributed throughout the southeastern United States including Alabama, Arkansas, Florida, Georgia, Illinois, Indiana, Kentucky, Louisiana, Mississippi, North Carolina, Ohio, South Carolina, Tennessee, Texas, Virginia, and West Virginia (Choate et al. 1994; Wilson and Ruff 1999). In Louisiana, this species is distributed statewide. New records were obtained for Allen, Caldwell, Evangeline, Grant, Jackson, LaSalle, Livingston, Morehouse, Point Coupee, Rapides, Tensas, Vernon, Webster, and Winn Parishes (Fig. 5). *Corynorhinus rafinesquii* used culverts during both collecting seasons, but in greater numbers during summer (78% of culvert encounters were in summer, whereas 22% were in winter).

Conservation status.—Corynorhinus rafinesquii is listed as a species of least concern by IUCN and as S4 by the Louisiana Department of Wildlife and Fisheries (Holcomb et al. 2015). Rafinesque's Big-Eared Bat is considered by many to be rare across most of its distribution but is apparently abundant in Louisiana.

Specimens examined (12).—Allen Parish, US-165, 30°45.187'N 92°41.714'W, TTU-130151; Caldwell Parish, US-165, 32°01.355'N 92°07.861, TTU-130152; Evangeline Parish, I-49, 30°49.436′N 92°13.440′W, TTU-130153; Grant Parish, US-165, 31°46.479'N 92°22.581'W, TTU-130154; Jackson Parish, US-167, 32°20.398'N 92°42.687'W, TTU-130155; LaSalle Parish, US-84, 31°49.932'N 92°22.018'W, TTU-130156; Morehouse Parish, US-425, 32°56.307'N 91°51.240'W, TTU-130157; Point Coupee Parish, US-190, 30°32.798′N 91°26.836′W, TTU-130158; Rapides Parish, I-49, 30°59.402′N 92°19.072′W, TTU-130159; Tensas Parish, US-65, 31°45.506'N 91°28.426'W, TTU-130160; Webster Parish, US-371, 32°44.650'N 93°23.485'W, TTU-130162; Winn Parish, US-167, 32°00.692'N 92°39.384'W, TTU-130163.

Additional records, Louisiana Natural Heritage Program (2).—Livingston Parish, Maurepas Swamp WMA, 30°17.088'N 90°47.204'W; Vernon Parish, Fort Polk, 31°07.153'N 93°06.315'W.

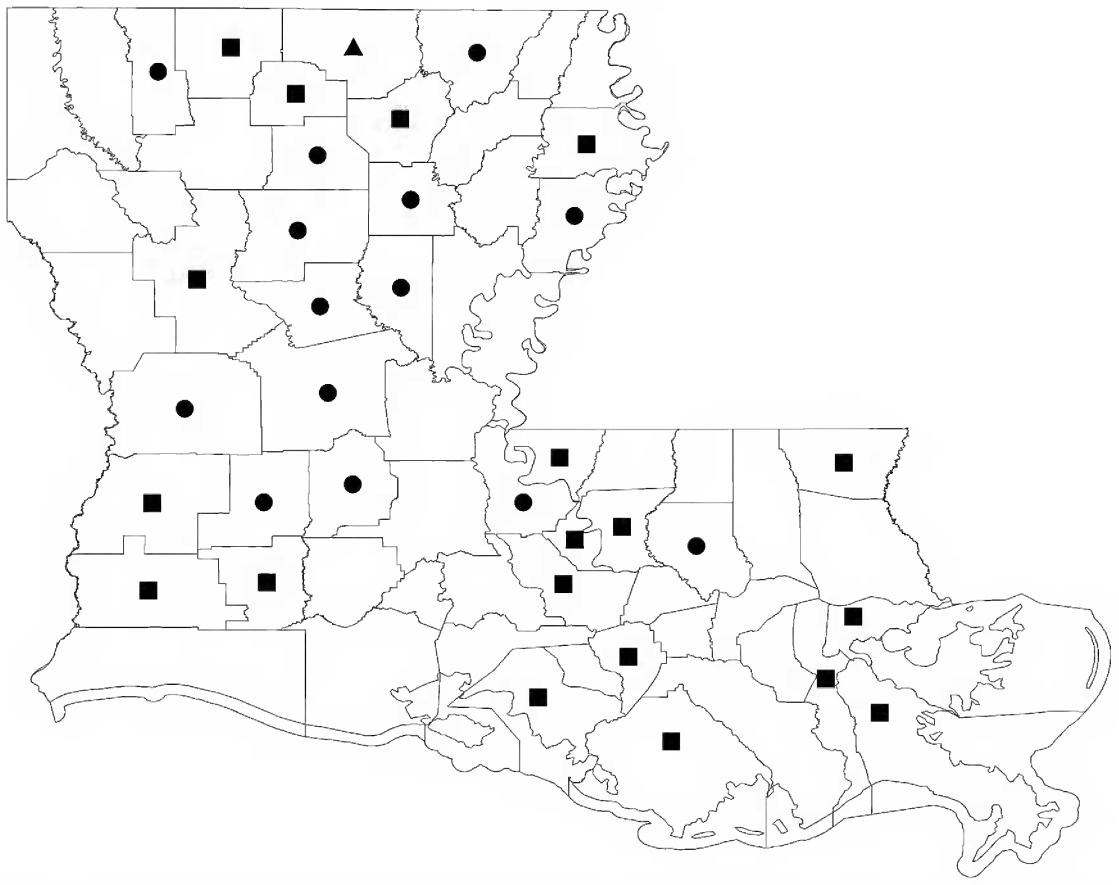

Figure 5. Map of recorded distribution, by parish, of Rafinesque's Big-eared Bat (*Corynorhinus rafinesquii*) in Louisiana. Circles represent new records discovered by our survey, squares represent records described by Lowery (1974), and triangles represent a confirmation of a Lowery (1974) record.

***Perimyotis subflavus* (F. Cuvier 1832)**
American Perimyotis

The American Perimyotis is distributed from southern Canada through most of the eastern United States, along eastern Mexico to Honduras (Wilson and Ruff 1999). This species is thought to be expanding its distribution westward based on a number of documented westerly range expansions (Geluso et al. 2005; Yancey and Jones 2006). In Louisiana, this species is distributed statewide except for the extreme southern portions of the state (Choate et al. 1994). New distributional records for *P. subflavus* were obtained from Bienville, Bossier, Caldwell, DeSoto, LaSalle, Sabine, Vernon, and West Feliciana Parishes (Fig. 6). This species is more commonly encountered in culverts in winter than in summer (82% of culvert encounters were in winter, whereas 18% were in summer). Moreover, this species was encountered more frequently in the northern portion of the state than the southern (Fig. 6).

Conservation status.—The American Perimyotis is listed as a species of least concern by the IUCN and as S4 by Louisiana Department of Wildlife and Fisheries (Holcomb et al. 2015). Based on our surveys, this species is common throughout the state and heightened conservation consideration is not warranted at this time.

Specimens examined (8).—Bienville Parish, I-20, 32°33.778'N 93°02.951'W, TTU-130164; Bossier Parish, I-20, 32°33.758°N 93°29.822W, TTU-130165; Caldwell Parish, US-165, 31°56.175'N 92°11.466'W, TTU-130166; DeSoto Parish, I-49, 32°15.421'N 93°44.598'W, TTU-130167; LaSalle Parish, US-165,

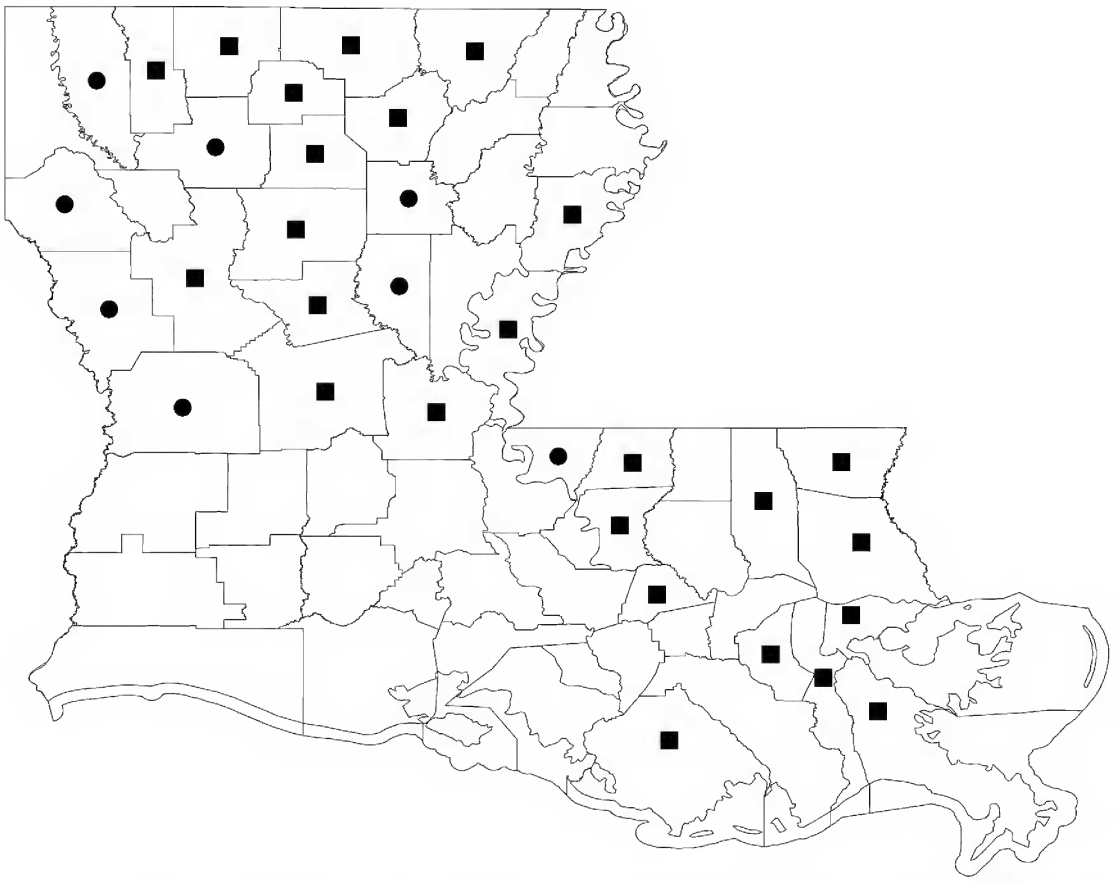

Figure 6. Map of recorded distribution, by parish, of the American Perimyotis (*Perimyotis subflavus*) in Louisiana. Circles represent new records discovered by our survey and squares represent records described by Lowery (1974).

31°53.245'N 92°14.671'W, TTU-130168; Sabine Parish, US-171, 31°21.166'N 93°24.960'W, TTU-130169; Vernon Parish, US-171, 31°01.659'N 93°16.176'W, TTU-130170; West Feliciana Parish, Tunica Hills WMA, North Trail, 30°56.307'N 91°30.655'W, TTU-130789.

Lasiurus seminolus (Rhoads 1895)
Seminole Bat

Lasiurus seminolus is distributed in the southeastern portion of the United States including Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Texas (Wilson and Ruff 1999). In Louisiana, this species is distributed statewide (Choate et al. 1994). New records were obtained for Allen, Beauregard, Clairborne, Tensas, Union, and Winn Parishes (Fig. 7).

Conservation status.—Seminole Bats are listed as a species of least concern by the IUCN and *L. seminolus* is not considered a species of conservation concern by the Louisiana Department of Wildlife and Fisheries (Holcomb et al. 2015).

Specimens examined (1).—Winn Parish, Kisatchie National Forest, Parish Road 828, 31°43.745'N 92°39.575'W, TTU-130171.

Additional Records, Louisiana Natural Heritage Program (5).—Allen Parish, West Bay WMA, 30°46.283'N 92°49.633'W; Beauregard Parish,

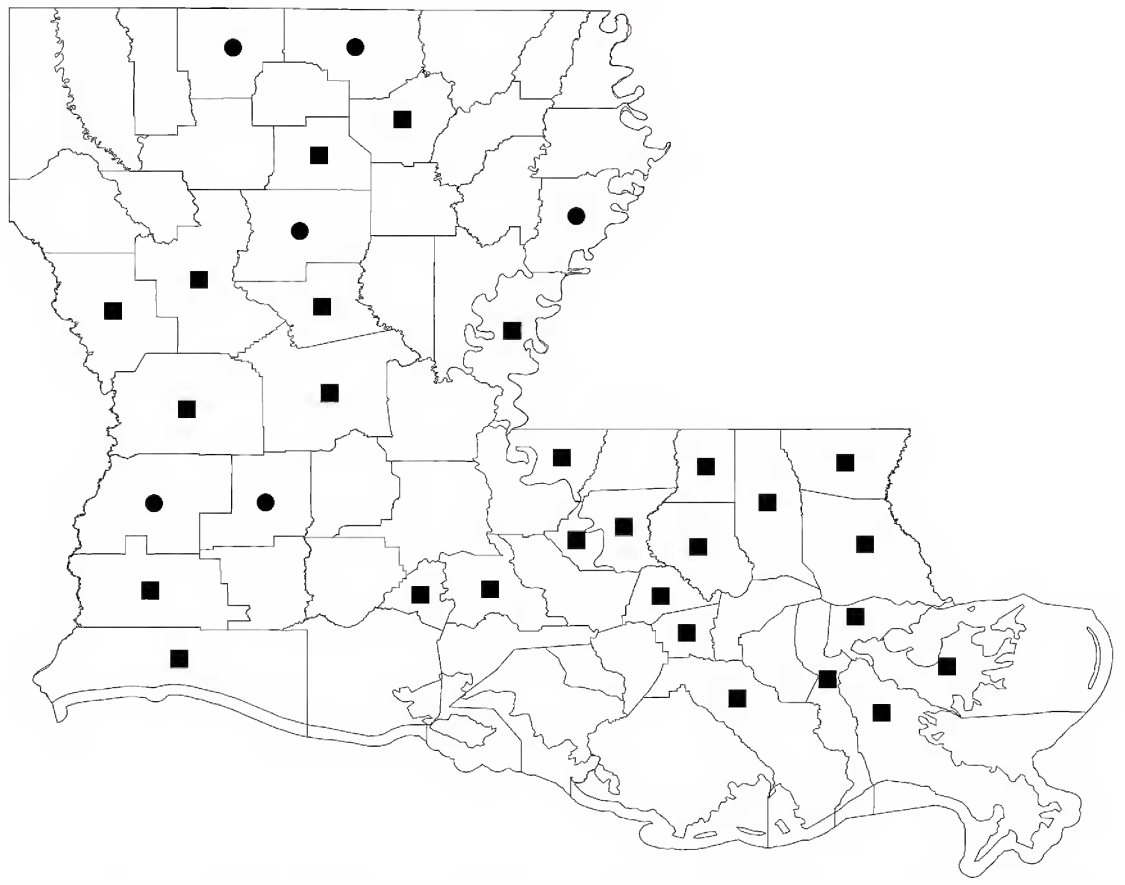

Figure 7. Map of recorded distribution, by parish, of the Seminole Bat (*Lasiurus seminolus*) in Louisiana. Circles represent new records discovered by our survey whereas squares represent records described by Lowery (1974).

Longville, 30°39.319'N 93°12.606'W; Claiborne Parish, Colquitt, 32°53.750'N 92°59.550'W; Tensas Parish, Tensas NWR, 32°7.383'N 91°28.217'W; Union Parish, Union WMA, 32°54.150'N 92°17.950'W.

***Eptesicus fuscus* (Palisot de Beauvis 1796)**
Big-Brown Bat

Eptesicus fuscus is one of the most widely distributed and abundant bat species in North America. It ranges from mid-Canada throughout the United States and Mexico, and through parts of Central America into South America (Wilson and Ruff 1999). In Louisiana, its distribution is statewide with the exception of the extreme southern portion of the state (Choate et al 1994). New records were obtained for Bienville, Bossier, DeSoto, Grant, Jackson, LaSalle, Lincoln, Rapides, Union, Vernon, West Feliciana and Winn parishes (Fig. 8). More individuals were encountered in culverts during winter than summer (81% of culvert encounters were in winter, whereas 19% were in summer).

Conservation status.—Eptesicus fuscus is listed as a species of least concern by IUCN and as S2 [imperiled in Louisiana because of rarity (6 to 20 known extant populations) or because of some factor(s) making it very vulnerable to extirpation] by Louisiana Department of Wildlife and Fisheries (Holcomb et al. 2015). Because this species appears to be common in the state, reconsideration of its conservation status by state agencies may be warranted.

Specimens examined (9).—Bienville Parish, I-20, 32°33.726′N 93°00.352′W, TTU-130172; DeSoto

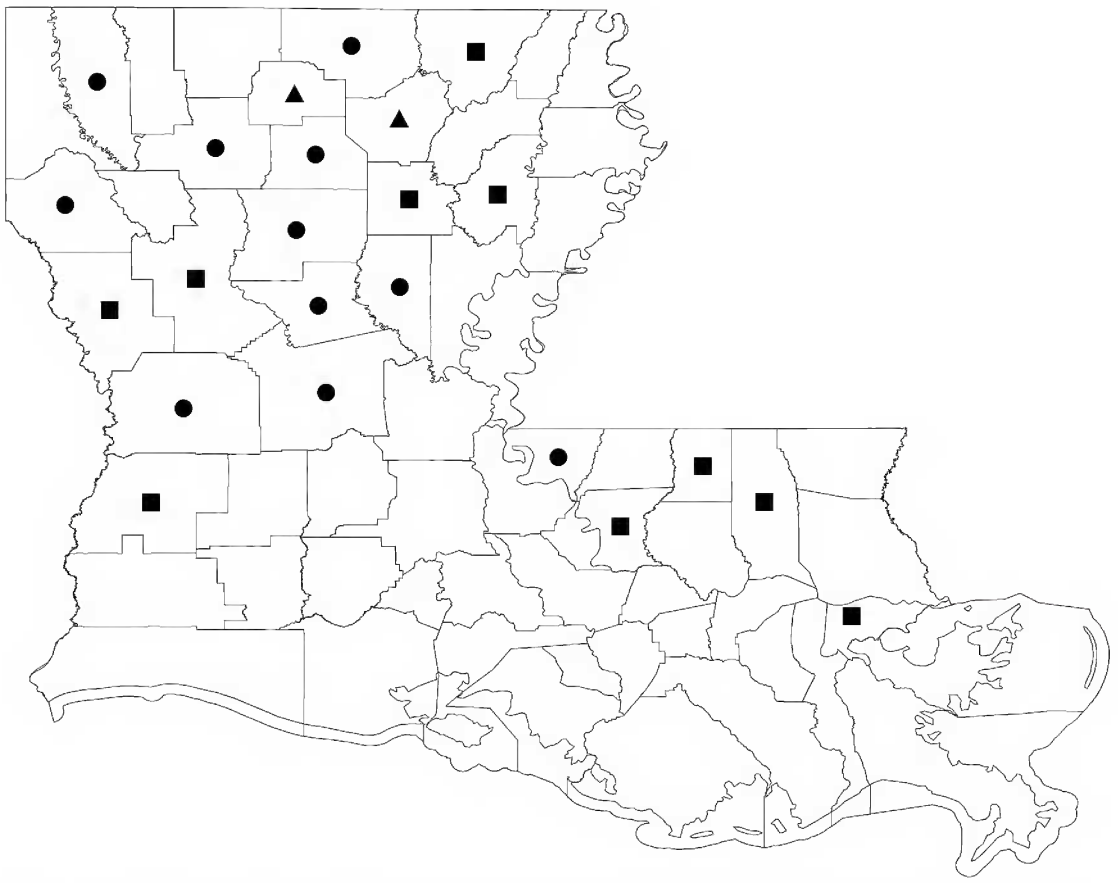

Figure 8. Map of recorded distribution, by parish, of the Big Brown Bat (*Eptesicus fuscus*) in Louisiana. Circles represent new records discovered by our survey, squares represent records described by Lowery (1974), and triangles represent a confirmation of a Lowery (1974) record.

Parish, I-49, 32°17.779′N 93°44.778′W, TTU-130173; Grant Parish, US-165, 31°37.294'N 92°25.182'W, TTU130174; LaSalle Parish, US-165, 31°52.452'N 92°15.472'W, TTU-130175; Lincoln Parish, I-20, 32°32.380'N 92°34.119'W, TTU-130176; Rapides Parish, I-49, 31°24.498′N 92°42.950′W, TTU-130177; West Feliciana Parish, US-61, 30°58.027′N 91°20.708′W, TTU-130178; Union Parish, US-167, 32°51.655'N 92°39.434'W, TTU-130180; Winn Parish, US-167, 32°00.710′N 92°39.357′W, TTU-130179.

Additional records, Louisiana Natural Heritage Program (3).—Bossier Parish, Bodcau WMA, 32°45.883'N 93°29.617'W; Jackson Parish, Jackson-Bienville WMA, 32°15.217'N 92°44.417'W; Vernon Parish, Fort Polk, 31°00.887'N 93°09.410'W.

CONCLUSIONS

Fifty-nine parish records of bats in Louisiana were recorded. Differences between the current survey and historical distributional information for the six vespertilionid species may be due to climate change causing distributional changes of some bat species in the United States (Yancey and Jones 2006). Alternatively, differences may be due to incomplete historical sampling of Louisiana. These records enhance our understanding of distribution of bats in the state. Nonetheless, these additions highlight the need for continued

investigation of the natural history, distribution, and abundance of bats in Louisiana to detect future changes and better document distributions.

Louisiana bats appear to exhibit at least some species-specific and seasonal differences in use of culverts. For example, *E. fuscus* and *P. subflavus* appear to use culverts more frequently in winter, whereas *C. rafinesquii* appears to use them more often in summer. Roosts are important sites for sleeping, mating, hibernating, facilitating complex social interactions, and offering protection from the environment (Kunz and Lumsden 2003). Given apparent variation among species in terms of roost use, future studies should better quantify this interaction. Indeed, if particular aspects of culverts can be distinguished as important for utilization by bats, such considerations may be incorporated into future highway development and maintenance as well as other conservation plans and strategies to better manage bat populations in a changing world.

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